Express Mail No.: EL039910373US　　　　　　Deposit Date: November 25, 1998

APPLICATION FOR UNITED STATES LETTERS PATENT

FOR

SEAWALL PANEL

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This application claims the benefit of U.S. Provisional Application No. 60/066,588, filed November 26, 1997.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates generally to a retaining panel for a body of water and, more particularly, to a retaining panel that may protect against a bounding shore with its top preferably extending above ground level and its bottom preferably anchored down into the ground below the water bottom. A preferred embodiment of a retaining panel of the present invention may be adapted for use as a seawall, a ground erosion barrier, a barrier against land erosion caused by waterways such as rivers, streams, ponds, lakes, seas, and oceans, a shoreline bulkhead, a wave breaker, a retaining wall, a footbridge, or as a panel in a wall structure for any other suitable use. A retaining panel of the present invention may be made from a variety of materials using a variety of techniques which will become apparent to one of ordinary skill in the art upon reading this disclosure. For example, a retaining panel of the present invention may comprised of extruded plastic or other similar material.

Over the years, there has existed the problem of land erosion caused by waterways such as rivers, streams, ponds, lakes, seas, and oceans. In order to limit and/or prevent the land erosion, efforts have been made to provide a series of seawall panels that are laterally aligned, interconnected, and anchored into the ground so as to provide a barrier against a waterway. The seawall panels may be subjected to enormous pressures and loads which may ultimately break

2

the connection between adjacent seawall panels. Consequently, the barrier may become less effective over time, and individual seawall panels may have to be repaired or replaced. This may be expensive, and it may require the use of special heavy construction equipment.

In light of the costs of repairing barriers made from seawall panels, a need exists for seawall panels that are better adapted to endure various pressures and loads. Another need exists for minimizing the pressures and loads that are applied on the joints between adjacent seawall panels. There is also a need for minimizing the number of seawall panels required to make a barrier so that there are fewer joints that are subjected to various pressures and loads. Still another need exists for providing seawall panels that are easier to install and replace.

The present invention satisfies some or all of these needs. A preferred embodiment of the retaining panel comprises a central portion, two side portions, and two flanges. It is preferred that the retaining panel is of one-piece construction. The central portion has a first end and a second end. The first side portion is integrally connected to and extends rearwardly at a first angle from the first end of the central portion. Similarly, the second side portion is integrally connected to and extends rearwardly at a second angle from the second end of the central portion. The first flange is integrally connected to and extends from a rear end of the first side portion, and the second flange is integrally connected to and extends from a rear end of the second side portion. Each of the flanges has a proximal portion and a distal portion. The distal portion of the first flange defines a female connecting portion, and the distal portion of the second flange defines a male connecting portion. As a result, the retaining panel is preferably adapted to be connected to a substantially similar, adjacent retaining panel by inserting its male connecting portion into the female connecting portion of the adjacent retaining panel. It is further preferred

that the retaining panel is adapted to be interlocked with the adjacent retaining panel by inserting the male connecting portion of the retaining panel into the female connecting portion of the adjacent retaining panel.

It is preferred that the first angle and the second angle are approximately equal. It is further preferred that the lengths of the first and second side portions are approximately equal. The first flange may extend from the first side portion at a third angle, and the second flange may extend from the second side portion at a fourth angle. The third and fourth angles are preferably about equal. It is preferred that the central portion is approximately parallel to the proximal portions of the first flange and the second flange.

A preferred embodiment of a retaining panel of the present invention may have a substantially uniform thickness. It should be recognized, however, that the thickness of a retaining panel of the present invention may vary. It is also preferred that an intermediate portion of the central portion has a substantially level outer surface approximately between the first end and the second end. Similarly, an intermediate portion of the first side portion may have a substantially level outer surface approximately between the first end of the central portion and the rear end of the first side portion, and an intermediate portion of the second side portion may have a substantially level outer surface approximately between the second end of the central portion and the rear end of the second side portion. Moreover, the proximal portion of the first flange may have a substantially level outer surface approximately between the rear end of the first side portion and the distal portion of the first flange, and the proximal portion of the second flange may have a substantially level outer surface approximately between the rear end of the second side portion and the distal portion of the second flange.

4

A retaining panel of the present invention may be made from a variety of materials. For example, a retaining panel of the present invention may be made from plastic, wood, steel, other sufficiently rigid materials, or combinations of these materials. A preferred embodiment of a retaining panel of the present invention is comprised of a plastic material such as polyvinyl chloride (PVC). A plastic material preferably prevents and/or withstands heat, cold, pressure exerted by the water, pressure exerted by the land, corrosion, and sunlight. A plastic material also preferably makes a retaining panel of the present invention relatively lightweight, easy to install, and easy to repair or replace. In addition, conventional extrusion or molding processes may be utilized to make a retaining panel of the present invention from a plastic material.

In addition to the novel features and advantages mentioned above, other objects and advantages of the present invention will be readily apparent from the following descriptions of the drawings and preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross sectional view of a preferred embodiment of a retaining panel of the present invention;

Figure 2 is a top perspective view of the retaining panel of Figure 1;

Figure 3 is a bottom perspective view of the retaining panel of Figure 1;

Figure 4 is a top plan view of the retaining panel of Figure 1;

Figure 5 is a bottom plan view of the retaining panel of Figure 1;

Figure 6 is a left side elevational view of the retaining panel of Figure 1;

Figure 7 is a right side elevational view of the retaining panel of Figure 1;

Figure 8 is a cross sectional view of a preferred embodiment of an installation that may utilize a preferred embodiment of a retaining panel of the present invention;

Figure 9 is another cross sectional view of the installation shown in Figure 7;

Figure 10 is a cross sectional view with dimensions of another preferred embodiment of a retaining panel of the present invention;

Figure 11 is a cross sectional view with dimensions of the left distal portion of the retaining panel of Figure 10; and

Figure 12 is a cross sectional view with dimensions of the right distal portion of the retaining panel of Figure 10.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT(S)

The present invention is directed to a retaining panel that may protect against a bounding shore with its top preferably extending above ground level and its bottom preferably anchored down into the ground below the water bottom. Figures **1** through **7** illustrate a preferred embodiment of a retaining panel of the present invention. The retaining panel **10** includes a central portion **20**, a first side portion **30**, a second side portion **40**, a first flange **50**, and a second flange **60**. As shown in these figures, the retaining panel **10** is preferably of one-piece construction for maximum durability and longevity. A one-piece construction preferably eliminates unnecessary joints which may eventually fail under the pressures and loads in the field.

The retaining panel has an outer surface **12**. The central portion **20** has a first end **22** and a second end **24**. The first side portion **30** is integrally connected to and extends at an angle **a** from the first end **22**. Similarly, the second side portion **40** is integrally connected to and extends

at an angle **b** from the second end **24**. The length of the first side portion **30** is preferably about equal to the length of the second side portion **40**, and the angle **a** is preferably about equal to the angle **b**. However, the length of the first side portion **30** may be different than the length of the second side portion **40**, the angle **a** may be different than the angle **b**. For instance, the aforementioned angles and lengths may vary to enable interconnected retaining panels to conform to the shape of the land.

The first flange **50** is integrally connected to and extends from a rear end **32** of the first side portion **30**, and the second flange **60** is integrally connected to and extends from a rear end **42** of the second side portion **40**. The first flange **50** extends from the first side portion **30** at an angle **c**, and the second flange **60** extends from the second side portion **40** at an angle **d**. The angle **c** is preferably about equal to the angle **d**. However, it should be recognized that the angle **c** may vary from the angle **d**. For example, the angle **c** may be different than the angle **d** so that adjacent retaining panels may be interconnected as will be explained hereinafter.

The first flange **50** has a proximal portion **52** and a distal portion **54**. Similarly, the second flange **60** has a proximal portion **62** and a distal portion **64**. The distal portion **54** defines a female connecting portion **56**, and the distal portion **64** defines a male connecting portion **66**. As a result, the retaining panel **10** is preferably adapted to be connected to a substantially similar, adjacent retaining panel by inserting its male connecting portion **66** into the female connecting portion of the adjacent retaining panel. It is further preferred that the female connecting portion **56** and the male connecting portion **66** enable the retaining panel **10** to be interlocked with the retaining panel. Those skilled in the art should recognize that the distal portions **54**, **64** may be of various shapes.

7

Figures **8** and **9** show an example of a barrier installation which may utilize a preferred embodiment of a retaining panel of the present invention. A preferred embodiment of a retaining panel of the present invention may also work with other types of barrier installations. In addition, a preferred embodiment of a retaining panel of the present invention may be interconnected to form other types of wall structures.

EXAMPLE

A retaining panel of the present invention was manufactured using conventional extrusion equipment. The dimensions of the retaining panel are illustrated in Figures **10** through **12**. The retaining panel was made from a weatherable, impact modified PVC having a minimum cell classification of 1-4013-13-0101 and the following material and mechanical properties:

Material Properties	Value
Specific Gravity	1.44
IZOD Impact, ft. lb./in. notch	15
Tensile Yield Strength	6,300
Tensile Modulus, psi	360,000
Flexural Yield Strength, psi	12,000
Flexural Modulus, psi	380,000
DTUL@264 psi, degrees C	72

Mechanical Properties	Value
Coverage Per Sheet (in.)	24.00
Depth of Cross Section (in.)	9.00
Wall Thickness (in.)	0.28
Section Modulus (cu. in./ft.)	19.70
Allowable Moment (ft. lbs./linear ft.)	4378
Moment of Inertia	88.65
Allowable Shear (lb./ft.)	2433

The retaining panel offered the following benefits: (1) consistent physical properties; (2) a desired strength-to-weight ratio; (3) reduces installation time and costs due to increased width

as compared to other retaining panels; (4) effective distribution of loads throughout the panel; (5) interlocking at the rear where stress is lower; (6) U-shape design's higher section modulus allows greater spacing between wales to reduce the number required in certain situations; (7) the strength of the U-shape permits cantilevering in some applications; (8) easy to drive and can be driven one at a time as opposed to Z-shaped panels which may require driving two at a time; (9) little or no rotation during installation; (10) interlocks are not readily visible; (11) interlocking design allows inside or outside curves to follow natural contours; and (12) environmentally safe, virtually maintenance free, no need to paint, and impervious to sunlight, saltwater, and marine borers.

The preferred embodiments herein disclosed are not intended to be exhaustive or to unnecessarily limit the scope of the invention. The preferred embodiments were chosen and described in order to explain the principles of the present invention so that others skilled in the art may practice the invention. Having shown and described preferred embodiments of the present invention, those skilled in the art will realize that many variations and modifications may be made to affect the described invention. Many of those variations and modifications will provide the same result and fall within the spirit of the claimed invention. It is the intention, therefore, to limit the invention only as indicated by the scope of the claims.